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Scientific Intelligence Report

New Space Facilities at the Tyuratam Missile Test Center

14 October 1964

Office of Scientific Intelligence

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PREFACE

The Tyuratam rangehead has undergone continuous, intensive expansion for the past 4 years and has proliferated into 30 identified launch positions comprising 11 launch complexes spread over an area approximately 45 by 30 miles. All Tyuratam space launchings, however, have been confined to two of these launch positions (Complexes A and B), which probably were originally designed about 1955. The construction of new rangehead facilities is an important indicator of forthcoming increased Soviet space capabilities. This study, using all-source material available to [ ] has been undertaken as part of an effort to anticipate the next major development in the Soviet space program.

25X1D

CONTENTS

FIGURES

NEW SPACE FACILITIES AT THE TYURATAM MISSILE TEST CENTER

PROBLEM

To assess the significance of new facility construction at the Tyuratam Missile Test Center for indications of an expanded Soviet space effort.

CONCLUSIONS

25X1B

DISCUSSION

25X1E [redacted]

PHOTOGRAPHIC COVERAGE

An improved, and in some cases a revised, understanding of the ICBM facilities at the Tyuratam Missile Test Center has resulted from excellent quality photography during the first three quarters of [redacted] There is a gap in Tyuratam coverage, however, from [redacted]

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25X1D

A comparable advance in an understanding of the space launch facilities at Tyuratam has not taken place, but this deficiency in knowledge is expected to diminish in the ensuing months. [redacted] supplied what was probably the beginning of such understanding. (See figure 1.)

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Launch Complex J

A large support facility, on which work began in [redacted] is being rapidly constructed west of Complex A. (See figures 2, 3, and 4.) The new facility, now designated Complex J, has not progressed far enough to identify associated launch facilities. Under construction is a housing area, a heat/power plant, and a construction support area. The construction support area contains three concrete batch plants, each having an inclined conveyor 170 feet long with a maximum height of [redacted] feet and four tanks or construction silos approximately 65 feet high. The easternmost batch plant has an additional conveyor parallel to the rail spur. Material stock piles are close by. Six additional buildings, each approximately 235 feet by 45 feet, are under construction east of the main rail line.

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25X1D

A new rail spur with a total length of approximately one mile is under construction on the east side of the main rail spur and now terminates northeast of a large building or buildings under construction. Initially, only ditches and holes for foundations were apparent. There were six linear parallel ditches 780 feet in length and spaced approximately 125 feet apart. No concrete work could be seen in the ditches and, considering their width, the possible range of separation was from 115 to 160 feet. Overall dimensions of this construction are 780 by 615 feet. [redacted] revealed that the steelwork is being erected for only one of the two expected buildings in this area. Foundations for the second building are no longer apparent.

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No direct connections to Complex A other than the construction trails can be identified. The distance from this support area to Complex A by main road is 10.3 nautical miles. The distance to Complex A by unimproved road is 2.1 nautical miles. The distance from the large building under construction to pad A1 is 1.9 nautical miles.

Until evidence of a launch pad(s) is obtained, it cannot be determined conclusively whether or not the new facility will be a separate launch complex. An alternate, although slight, possibility is that the new construction will be associated with pad A1. In the past, the appearance of new support facilities has foreshadowed the initiation of new launch complex construction and generally the initiation of new programs of which no prior knowledge or evidence has usually existed. [redacted]

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If the new facility develops into a launch complex, new flight test programs could possibly be initiated by mid-1966. This new facility, therefore, cannot provide immediate research and development support to Soviet missile or space programs.

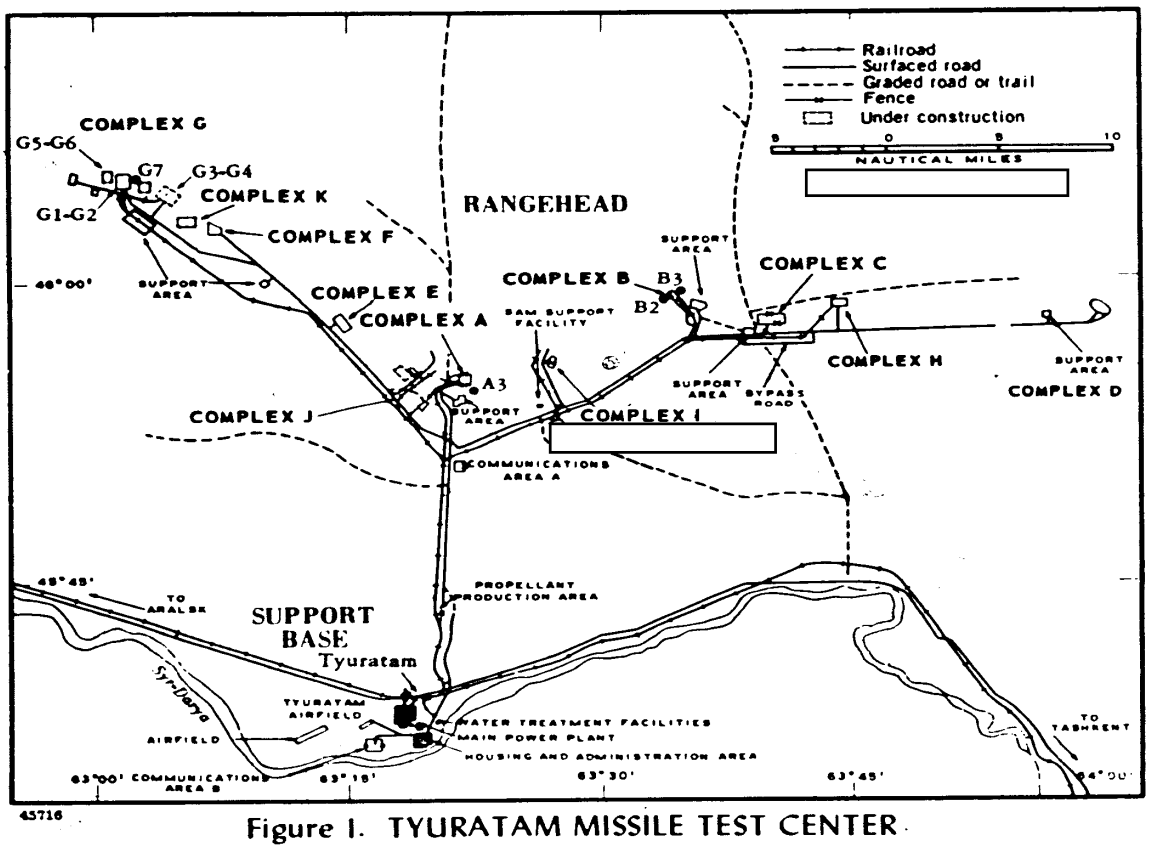

Figure 1. TYURATAM MISSILE TEST CENTER

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25X1D

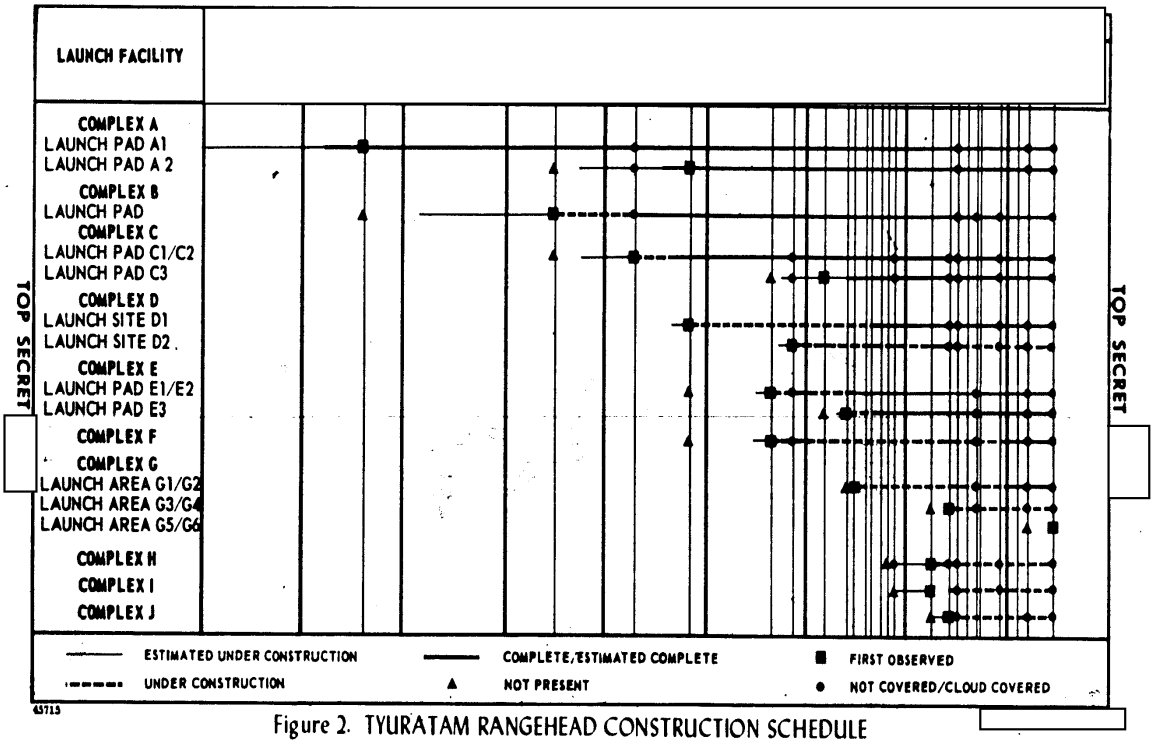

Figure 2. TYURATAM RANGEHEAD CONSTRUCTION SCHEDULE

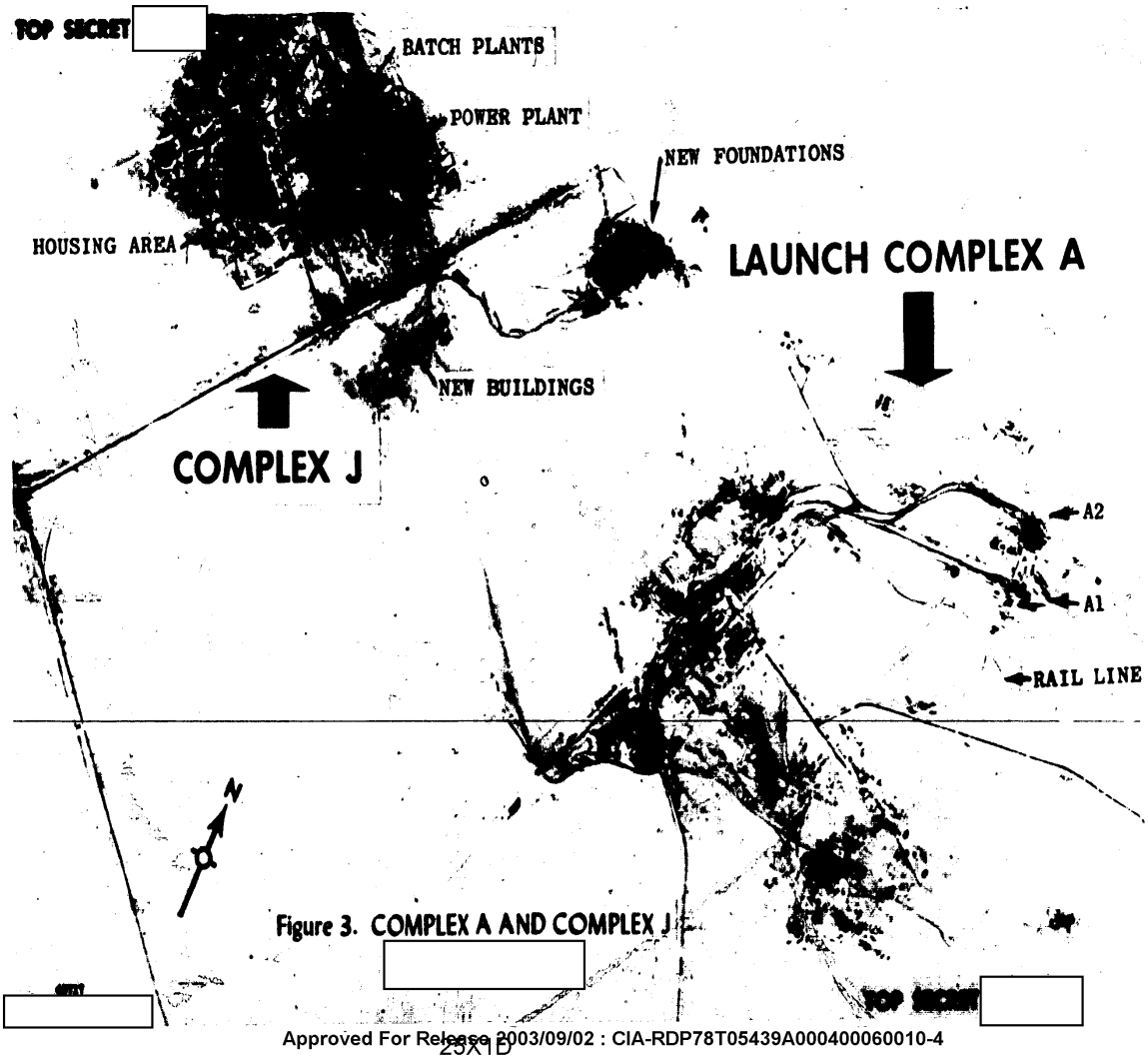

Figure 3. COMPLEX A AND COMPLEX J

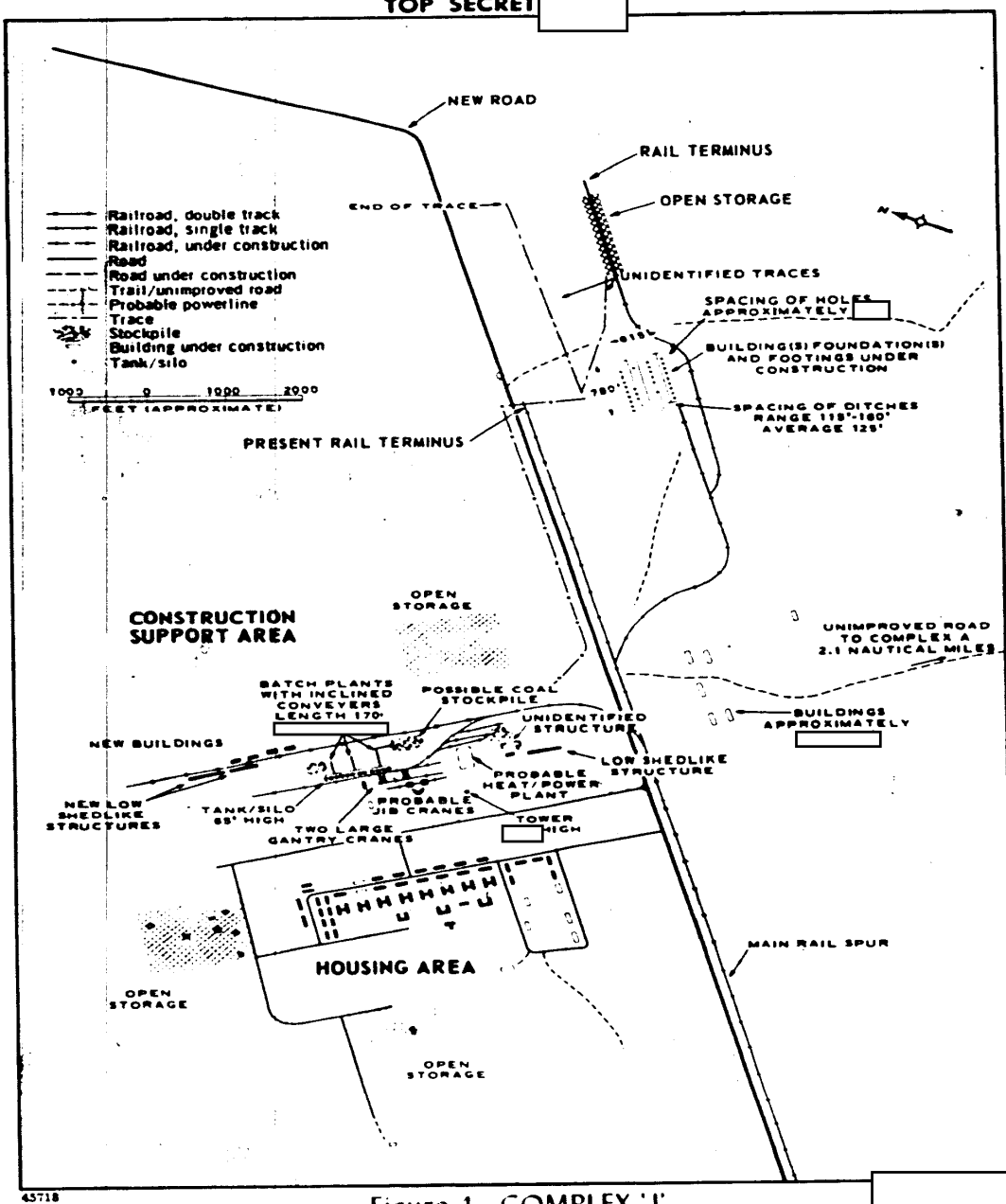

Figure 4. COMPLEX 'J'

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Launch Complex B

25X1D An oblique photograph obtained during [redacted] 25X1D has provided the best configuration view obtained since Complex B became operational early in [redacted] 25X1D (See figure 3.) Although the launch structure cannot be closely dimensioned, the qualitative evidence confirms that it is similar and of the same order of magnitude as pad A1.

25X1D Photographs obtained during [redacted] in 25X1D [redacted] showed the following:

1. The secured area at Complex B had been enlarged by moving the northeast fence 1,200 feet farther to the northeast. The dimensions of the secured area are now approximately 5,100 by 2,600 25X1D feet. This enlargement took place between [redacted] 25X1D [redacted]

2. A new secured area, possibly an electronics facility, is located approximately 5,500 feet northeast of the launch pad. It appears to be approximately 1,400 feet square but fencing has not been identified on its southern boundary. It contains a building under construction with attached structures on each end and three small wings on one side. A small building with a possible dome attached is just northeast. There is also a second building under construction and two unidentified objects within the area.

25X1D [redacted] revealed a newly identified secured area located approximately 2,200 feet west of the launch pad. Fencing can be identified around a small hillock. Within this fenced area is a probable semiburied building approximately 180 by 110 feet. Improved road connections with this facility bypass the Complex B support area. Track activity led to the 25X1D area as early as [redacted] The function of this separate area is undetermined. Suggested uses are a high precision instrumentation site, or an independent ICBM silo launch facility.

The original pad (A1) at Complex A, the tower-over-pit facility, has supported the SS–6 development program, the Soviet man-in-space effort, the interplanetary probe program, and the heavy Cosmos vehicles which are recovered after near-space research missions. [redacted] 25X

[redacted] 25X

[redacted] 25X

[redacted] It was observed in the mid-stage of construction in [redacted] and was essentially 25X completed the following year. It may have been used for what have been termed "troop training" firings of the SS–6 in [redacted] Additions to Complex B since [redacted] have consisted chiefly of building construction. Six buildings were added in the housing section of the support area between [redacted] 25X [redacted] An additional 25X 20 buildings have been erected in the housing section since [redacted] Construction of 25X another rail-served assembly building was started during the summer of [redacted] and completed by the 25X summer of [redacted] That building, measuring about 25X 235 feet by 70 feet, is located at the terminus of the western branch of the railroad "wishbone." Another large rail-served checkout building, measuring 330 feet by 85 feet, was recently completed to the east of the rail tracks. The launch area at Complex B resembles the SS–6 deployed sites more closely than does pad A1. Both of these Tyuratam complexes have the same type of guidance facility. Although there is no direct evidence for the space utilization of Complex B, the series of seven space launchings with four different types of payloads in the short period of [redacted] 25X [redacted] 25X (shown below) suggests that two pads (Complex B and pad A1) were used for the series.

[redacted]

Result	Possible Launch Complex
Failure	A
Failure	B
Success	B
Success	A
Success	B
Failure	A
Success	A

25X

A comparable intermix of payloads had not occurred previously at Tyuratam. All of these vehicles used an SS–6 booster.

Launch Complex G

25X1D Construction at this Complex during [redacted] has already been reported in detail. No photographic coverage was obtained between [redacted] 25X1D
25X1D [redacted] (See figure 6.) Launch Pads G1/G2 are probably now complete. A 125-foot-tall mobile missile service tower is positioned between each launch pad and its ready building.

Construction is continuing on Pads G3/G4. The excavations are still open but details within them are not discernible. The rail line into the area divides into five spurs that are still under construction. At least eight buildings appear to be complete and earth mounded. A gantry approximately 200 feet tall and 20 feet wide is located on the pair of rails to the rear of G4. The multiple rail spurs, although now used for construction, could be used after completion to provide rail car access to the Complex's propellant tanks, as may also be the case at pad A2. The lack of any ready buildings at pads G3/G4, similar to the 30-foot-high buildings at pads G1/G2, suggests that the booster to be launched from pads G3/G4 will be larger than that to be launched from pads G1/G2, and that it will have a diameter in excess of 25 feet.

25X1D [redacted] revealed the start of construction of launch pads G5/G6 5,000 feet west of pads G1/G2. The new pads are about 600 feet apart. In the "unidentified" area west of the main support facility, the two buildings in the westernmost secured area appear to be complete. There are no apparent changes in the revetted area south of the access road.

Launch Complex A

25X1D Changes apparent in [redacted] are:

1. Continued activity indicated by the construction of a rail spur to a point approximately 5,700 feet southeast of pad A1. The rail does not appear to be in place as yet, but cut and fill have been accomplished. The curves in the spur appear to be the result of following the contour of the terrain. A small vague structure is near the terminus of the rail. In addition, a possible silo launch emplacement (site A3), similar to the construction northwest of Complex B, is seen on the [redacted] photographs southwest of the road to the new construction. (See figure 7.) 25X1D

2. A new building 100 by 30 feet has been constructed between pads A1 and A2, and a second building 90 by 30 feet has been constructed just southeast of pad A2.

3. Traces in the snow near the east end of the Instrumentation Control Center indicate the possibility of a new interferometer. Activity in this area is indicated by rows of probable electronic vehicles or vans.

4. The original SS–6 and SS–6 boosted spacecraft launcher at pad A1 appears to be unchanged.

SPACE PROGRAM STATUS

[redacted] 25X1B

[redacted] This examination does not necessarily have to be extended to the question of a manned lunar mission if the time scale is projected forward far enough to include only present capabilities. In general the following statements on the space program can be made: 25X1B

1. The Soviets have conducted an effective manned space exploration program based primarily on military hardware. They have a very effective launch support system and are able to launch at precise times. Further, they have a safe and reliable flight program. This is evidenced not only by the man-in-space flights, but also by the numerous recovered Cosmos vehicles. Although they took big steps early, the pace of their program has slowed and they are not exploiting the Vostok capsule's full orbital life time, as demonstrated by the Cosmos flights. Within the capability of their SS–6 booster they have apparently been marking time in manned flight program for almost two years.[2 3] Since continued apparent inactivity is not in consonance with the importance that the Soviets have placed upon their space program as a mechanism for projecting a strong technological and military image of the USSR, the manned program is expected to enter a new phase, possibly by the latter half of 1964.

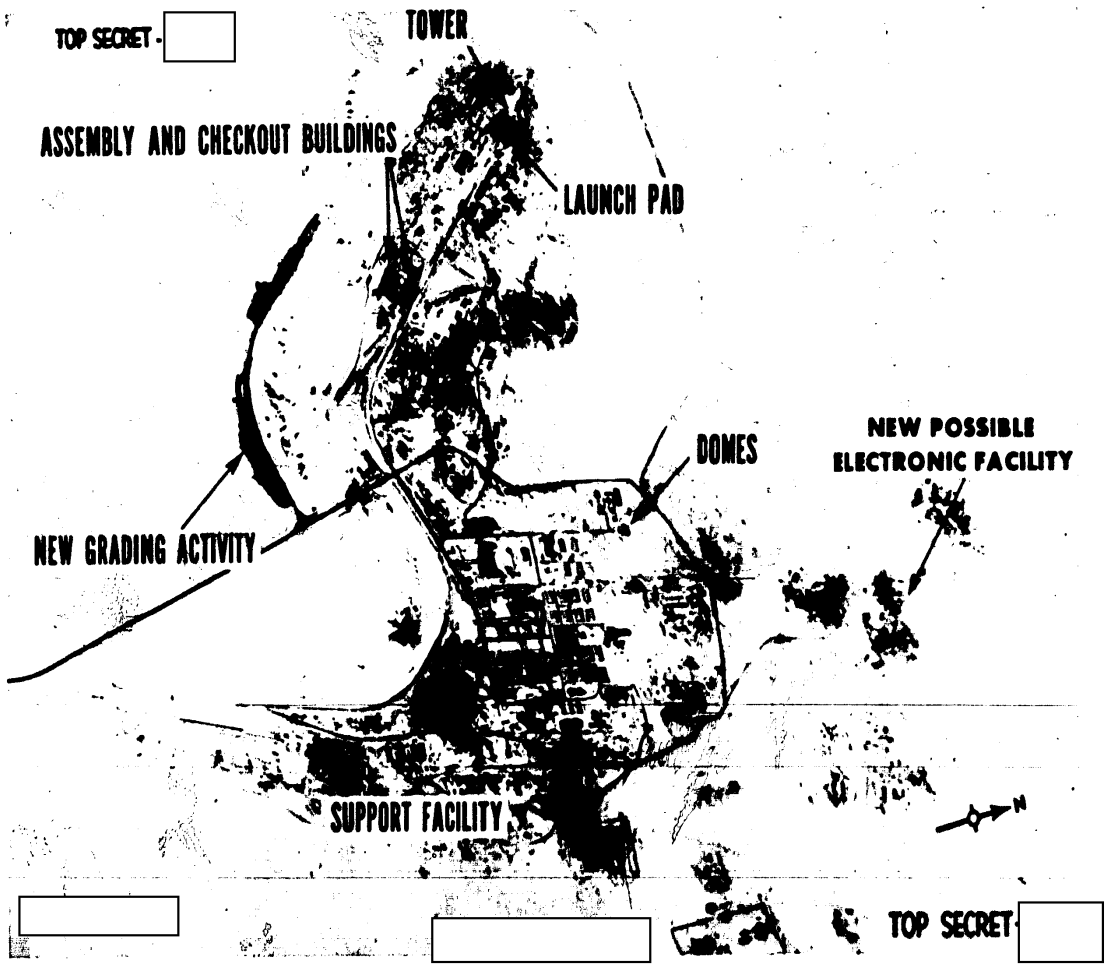

Figure 5. COMPLEX B

25X1D

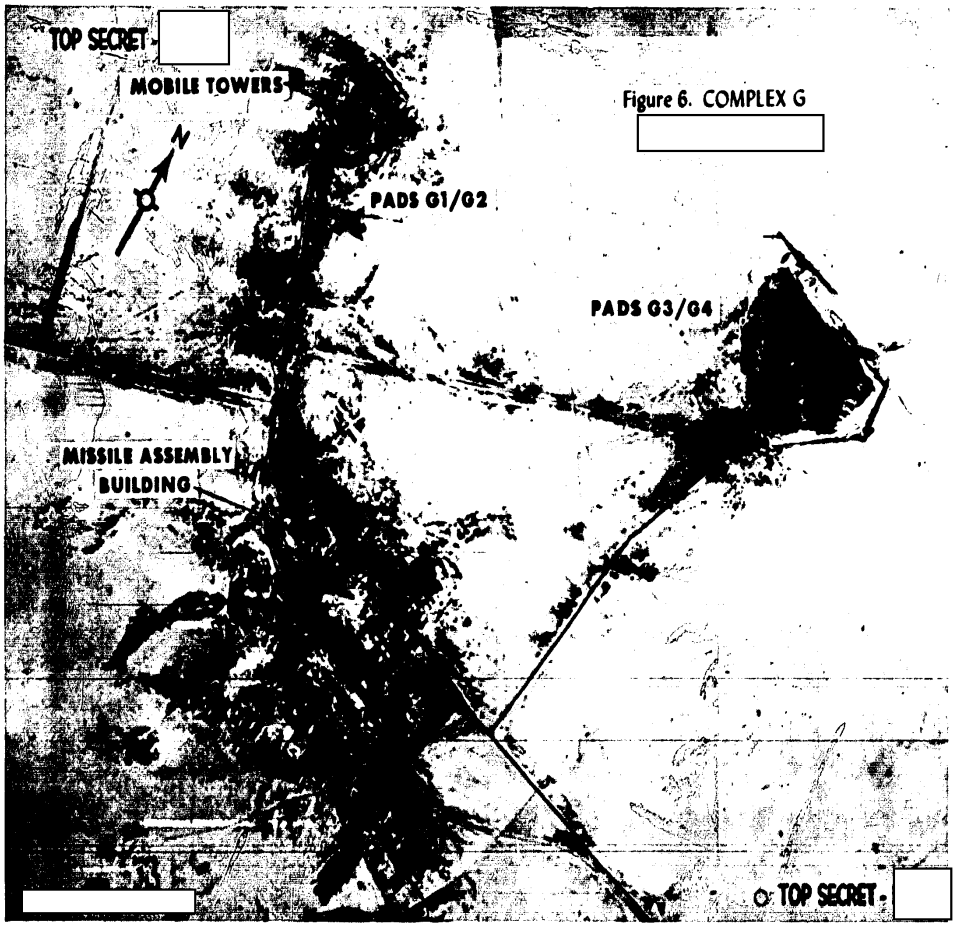

Figure 6. COMPLEX G

25X1D

Figure 7. COMPLEX A

2. Within the present capability of an SS–6 booster plus various upper-stage combinations, the Soviets can still:

a. Impact or orbit a number of planets.

b. Put up satellites with a 24-hour period.

c. Put up highly elliptical satellites to supplement their near-earth space research.

d. Conduct additional circumlunar flybys.

e. Conduct a space station program. A small station could be established with two launchings and one rendezvous using a Venik upper stage.

3. In the past a fixed number of about 16 SS–6 boosters seem to have been available in any one year. The [redacted] usage is probably indicative of inventory depletion. (See figure 8.) These have been apportioned between the SS–6, configured as a missile and as the first stage of all Soviet spacecraft. The competition must be intense for these obsolescent but highly reliable boosters. Also, the probability of an increase in mission types is evidenced by such changes as the current deployment of a new group of range instrumentation ships with extended capabilities. If the logical follow-on problems of manned space flight—manned rendezvous and docking, orbital transfer, a reliable restartable stage, and a higher specific impulse stage—are to be solved soon, an allocation of boosters for these development flights has to be made. It would seem reasonable, therefore, to expect a new work-horse booster somewhat larger than the SS–6 to augment the manned portion of the overall space effort. This new booster would not be a multimillion-pound-thrust vehicle comparable to the Saturn C–5. Even if the high costs of such a vehicle were not a consideration, the immediate flight hardware and techniques which require development would be technically handicapped by tying them to a super-large booster. The booster we are seeking lies hidden within the dynamic program in being.

POSSIBLE BOOSTER OPTIONS

One of the pacing items in an advanced spaceflight program is the propulsion system development. If there is a current need for an improved space booster, then a very strong candidate is a derivative of the SS–8 ICBM. This statement is based on:

1. A continuance of the philosophy of diverting military proven booster hardware and launch systems instead of initiating a separate development program. The SS–8 is proving to be a reliable launch system.

2. An approximate two-to-one single engine thrust increase over the SS–6 engine.[4] A clustered booster, again similar to the SS–6, would yield adequate options for advanced missions. Also, the SS–8 has a manned space capability arising from a low acceleration at engine cutoff.

3. A correlation between the design techniques of the SS–6 and the SS–8 which suggests that a single development group was responsible for both designs.[5] This space-associated competence is strengthened by the fact that the second-stage engine of the SS–8 is probably identical to the Venik engine.[6]

Although the Soviets may not be compelled to use the SS–8 as a building block, they certainly have the option to. It is good program sense to capitalize on proven hardware, as the Soviet program has demonstrated many times. For example, the exploitation of the Lunik stage for the Vostok program. A cluster of five or eight structurally modified SS–8's could be used as a booster, and either liquid oxygen/hydrazine mix or liquid oxygen/liquid hydrogen used as upper stage propellants. Ten possible combinations are listed in figure 9, and approximate performances depicted in figure 10. It should be noted that in considering various combinations of boosters and upper stages the problem has been treated as an exercise to establish thrust potential. Design limitations and/or staging incompatibility may preclude the realization of some of the combinations. The clustering thesis, however, remains valid.

FACILITIES ANALYSIS

Checkout Concepts

[redacted]

so productive that the lack of a better understanding of the checkout (or preparation) philosophy for the various vehicles has not often been considered a hindrance. The nonemphasis on checkout methods has carried over to the space program since all Soviet spacecraft to date have been boosted from Tyuratam by the SS–6.

Today, as new construction at Complex B, Complex J and Complex G is taking place—all of which may be space associated—a better understanding of how existing launch facilities are actually used would help in estimating for what purpose, and with what vehicles, the new sites will be used.

There currently appears to be three basic philosophies for vehicle preparation at unhardened sites at Tyuratam.

1. The method associated with the SS–6 at Complexes A and B. This method is classed as "undetermined" because even after the benefit of 7 years of overhead photography and several Soviet motion pictures of various cosmonauts' flights, the configuration of the launch structure and its method of operation are not understood.[7,8] The booster could be assembled at the rail-served checkout building or, quite possibly, on the pad.* If the Soviets have a 24-hour single pad turn-around capability for the SS–6, as they may have had for Vostok 3 and 4 in 1962, then a minimum of on-pad time would be required. However, the intercepted propulsion-associated telemetry from a space configured SS–6 booster at Tyuratam on 4 June 1963, which was seven days before the attempted launch of a Vostok vehicle on 11 June (Vostok 5 was launched on 14 June), would seem to indicate that upwards of one week on-pad is needed for Soviet spacecraft.[9–11]

Another undetermined facet of SS–6 handling is the fueling method. The current consensus is that the vehicle is fueled from fixed rather than from mobile tanks. The decision not to extensively deploy the SS–6 missile (other than at Plesetsk) was probably influenced by the cumbersome and fixed ground support equipment dictated by vehicle design, and the use of cryogenics.

25X1

2. The second method is that associated with the SS–7 at Complex C. The missile at first employed mobile trucks for fueling, and a missile erector. This concept, which is used for more than 50 percent of the deployed Soviet ICBM's, is

3. The third method is that associated directly with the SS–8 at Complexes A2 and E. Those complexes apparently utilize fixed fueling facilities, and rail lines (in the Complex) from the ready building to the launch pad.** Final assembly and checkout is presumably accomplished in these ready buildings.

Generally overlooked in the team competition which took place during between the SS–7 and SS–8 missiles was the fact that not only two missiles but two weapon systems concepts were being evaluated. The deployment prize has gone to the SS–7 but the handling concept for future systems favors the SS–8. The competition between these systems teams must have been vigorous. The need for a less complicated weapon system to reduce reaction time, crew size, and the ease of hardening the sites would have been overwhelming considerations in the choice of which missile would be deployed in numbers. Yet, while Complexes A2 and C were both started shortly before the SS–6 became operational at Plesetsk in early only grudging admission seems to have been given at that time to the SS–8 handling concept. (See figure 11.) This is substantiated by the fact that when Complex C was given a full

revealed "outrigger-like" structures extending downward from the sides of the Complex B launcher.* Further analysis indicates that the "outriggers" are boom structures which have been rotated downward and outward from a pivot point near the launcher base and not from a higher pivot. As such they do not function as outriggers to provide stabilization for the launch of a booster larger than an SS–6. The boom structures are visible and in an upright position in figure 5. Their actual function is unknown but they could be extended out to permit the erection of a booster or upper stage. It is of interest that Cosmos 33 was launched from Tyuratam 49 hours after No booster, however, is discernible in the photographs.

** Photographic coverage of Kozelsk during shows 4 separate rail lines from the ready buildings to the launch pads. A similar pattern of 2 rails was noticed at Tyuratam Pads E1 and E2 during Mission This pattern is indicative of a quick reload ability.

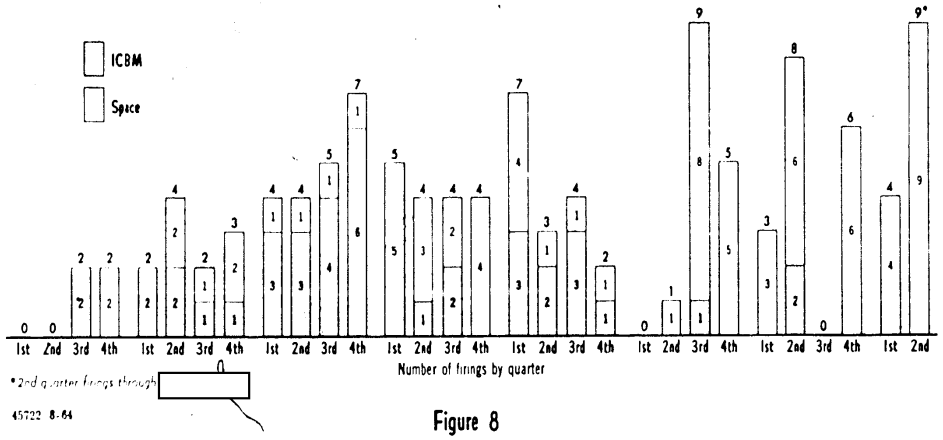

Figure 8
SS-6 FIRING RATE AT TYURATAM

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NOTE: 300 n.m. circular earth orbit used for payload calculations		FIVE CLUSTER					EIGHT CLUSTER				
PAYLOAD WEIGHT (THOUSAND LBS.) ▶		32	50	39	50	61	56	83	64	82	100
3rd STAGE	WEIGHT (1000 lbs.)	NO THIRD STAGE		113	144	160	NO THIRD STAGE		192	234	261
	THRUST (1000 lbs.)			130 (2x65)	130	130			200	200	200
	SPECIFIC IMP.			330	425	425			330	425	425
2nd STAGE	WEIGHT (1000 lbs.)	188	241	345	380	411	300	388	557	614	662
	THRUST (1000 lbs.)	300	200	300	300	400	300	300	600 (2x300)	600	600
	SPECIFIC IMP.	330	425	330	330	425	330	425	330	330	425
1st STAGE (BOOSTER)	WEIGHT (1000 lbs.)	1,000					1,600				
	THRUST (1000 lbs.)	1,300					2,080				
	SPECIFIC IMP.	310					310				

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Figure 9

SS - 8 BUILDING BLOCK OPTIONS

FOR DELIVERY OF PAYLOADS IN ORBIT

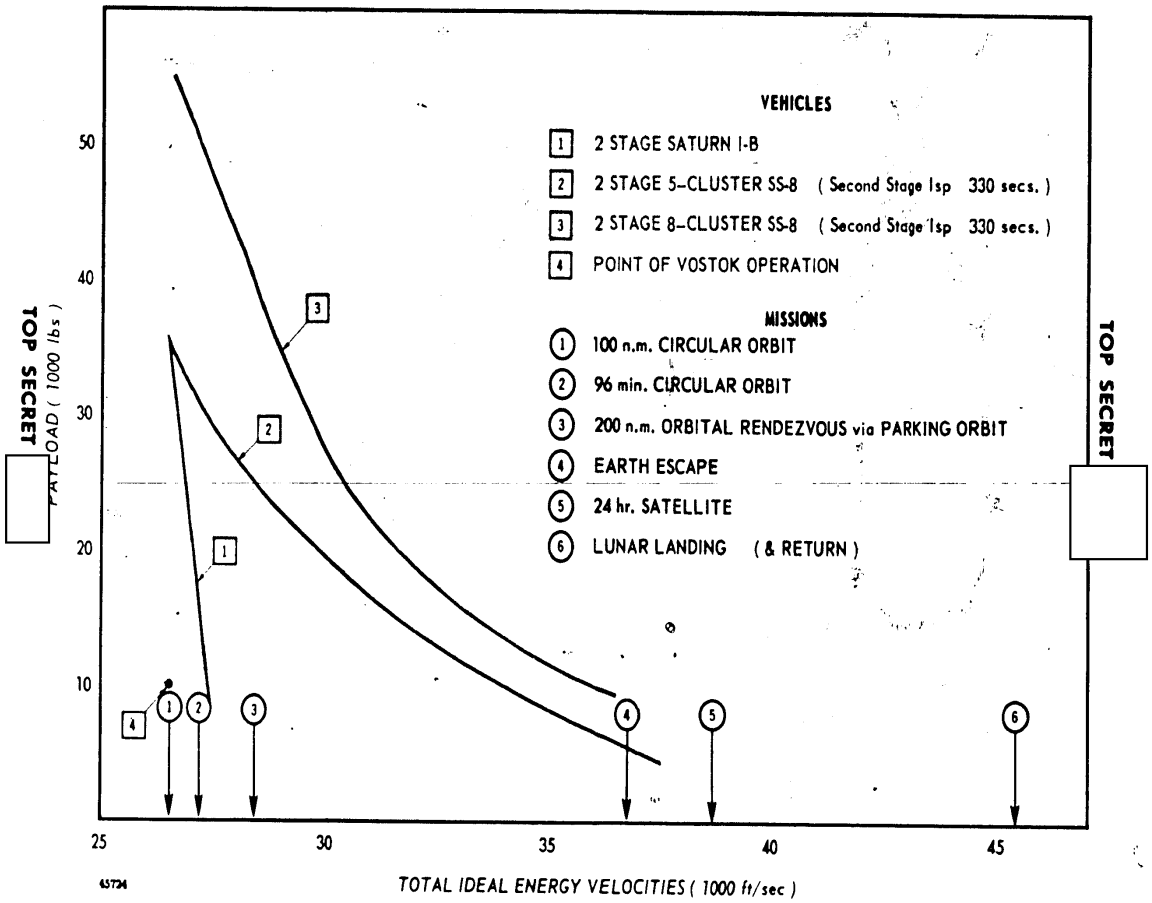

Figure 10. MINIMUM PERFORMANCE OF CLUSTERED SS-8 SPACECRAFT

ACTIVITY	1959	1960	1961	1962	1963	1964
FACILITIES CONSTRUCTION						
PAD A2 (SS-8 DEVELOPMENT)						
PADS C1 and C2 (SS-7 SOFT PROTOTYPE)						
PADS E1 and E2 (SS-8 SOFT PROTOTYPE)						
PAD E3 (SS-8 SOFT FIELD CONFIGURATION)						
PADS G1 and G2						
PADS G3 and G4 (VEHICLE UNKNOWN)						
DEPLOYED SITES						
COMPLEX H (SS-9 PROTOTYPE)						
SS-8 FLIGHT TEST PROGRAM S – SUCCESS F – FAILURE			7F 7S	6F 9S	3F 15S	

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Figure II. Timetable of the decision to use the SS-8 handling concept

scale go-ahead, only pad A2 was authorized as the engineering model of the final SS–8 complex. No other pre-prototype complex has been built at Tyuratam.

The advantages of the SS–8 concept apparently were then quickly noted, for pads E1 and E2 were started in mid-1961. At that time the SS–8 flight test program was not at all promising and the test sample was still small. Even before pads E1 and E2 were completed, the decision was made to go one step further and start on pad E3, which is the final prototype of the deployment sites. The new handling concept was far ahead of the rest of the SS–8 missile system as evidenced from its continued use at Complexes G, H, and the deployed type II–D sites. The results of the SS–8 flight test programs were deplorable during the years that these facility decisions were being made. This is reflected in the fact that no new SS–8 soft sites were started after [redacted] and several sites for the SS–8 which were underway at Gladkaya were switched to accommodate SS–7's.[14]

5X1

If a basic change in Soviet missile philosophy has taken place and a particular missile has been isolated from its handling concept, then it will be more difficult to estimate for what purpose, and with what vehicles, new sites will be used. Complex G, for example, could then be used either primarily for missile firings or space launchings.

Comparison of Complexes A, E, and G

The major external similarities of the launch areas for Complex A2, E, and G are listed in figure 12. These complexes (see figures 13, 14, and 15) have been extensively described from photography.[1 15–19] The external similarities of the launch pads, at Complex G and the other launch pads, when considered alone, indicate that Complex G is intended to support a missile system. Comparison of the entire Complex G with Complex A, however, tends to show an intended space association. The latter similarities are:

1. The building arrangements of the main support area with a rail-served assembly building (approximately 400 by 100 feet in each case) in "close-coupled" support of the launch pads. The term "close-coupled" is used in the sense that the assembly building is within the complex proper, and is not set off to one side of the launch pads as it is in the prototype missile deployment complexes.

2. Both complexes contain an electronics facility with numerous support buildings. Again, the pattern at Complex G is more similar to a research and development arrangement and the [redacted] arrangements of Complex A than the pattern found at the purely missile complexes such as D or E.

3. The presence of a probable upper stage assembly building in each complex (A and G). At Complex A this is Missile Assembly Building No. 2, which probably serves both Complex A and B. Photography of Complex A in [redacted] clearly shows small solid propellant storage areas, and a small liquid filling area, adjacent to the road- and rail-served Missile Assembly Building No. 2.[20 21] By comparison, the "unidentified" building west of the main support area at Complex G is similar in size to Missile Assembly Building No. 2 (210 by 70 feet at Complex G, and [redacted] feet at Complex A), and is also served by small solid propellant storage buildings and an excellent hard-surface road.* (See figure 17.)

25X

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* During the second quarter of [redacted] a permanent road was constructed from the south end of Complex A's Missile Assembly Building No. 2 to the major east-west road. Two possible reasons for this short road are:

1. The SS–8, or a segment of the SS–8's, being launched from Complex E could be prepared in a portion of Missile Assembly Building No. 2, the upper-stage checkout building. Support for this possibility may exist in the fact that the SS–8 probably uses the Venik engine for its second stage.

2. The shortening of road transportation for flight-readied space stages from Missile Assembly Building No. 2 to Complex B. The need for transporting payloads from one complex to another could have been alleviated by the summer of [redacted] when the second large assembly building at Complex B was completed. The use of the road for transporting upper stages between Complexes A and B may not necessarily have ceased at that time. Although the checkout of a pair of basic Vostok capsules would not necessarily be hampered by doing the work at separate locations, the quality of a series of unique, nonrepetitive deep space probes (such as three Venus flyby payloads) would likely be degraded by separated preparation.

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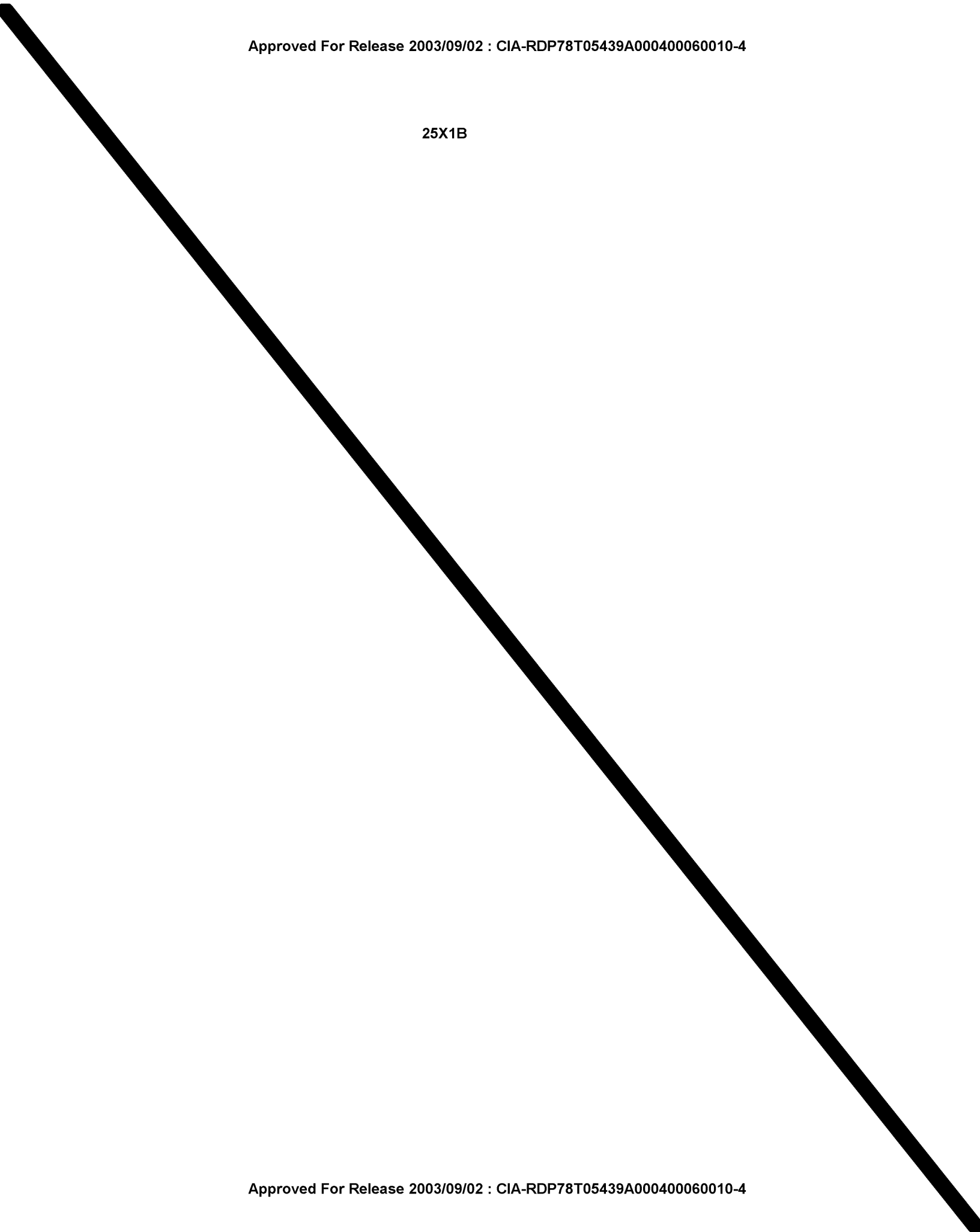

SITE FEATURE	A2	E1 AND E2	E3	G1 AND G2
FLAT PAD	70' x 80' (150' square, paved)	70' Circle (155' x 300', Paved)	60' Circle (130' x 200', Paved) Contains 15' diameter probable launch stand, [redacted]	190' Circle Contains 60' diameter possible launch stand
BUILDINGS AT PAD	50' x 50' / 50' x 25' } 170' apart	105' x 45' / 110' x 35' / 195' x 55' } Same side	Buried	70' x 70' / 70' x 70' } 300' Apart
READY BUILDINGS	Uses missile assembly building no. 1	150' x 75' x 30' High	Uses E2 buildings	210' x 80' (Bunkered) 210' x 105' (Clear)
RAIL LINE FROM READY BUILDING TO PAD	Three lines and road	Two lines and road	Two lines and road	One line and road
TOWERS AT PAD	Small, on diagonally opposite corners	Probable light poles on opposite corners	150' High light towers	Two slender towers on opposite corners. Two movable towers approximately 125' high and 25' square

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Figure 12. COMPARISON OF SITE SIGNATURE DETAILS AT VARIOUS COMPLEXES

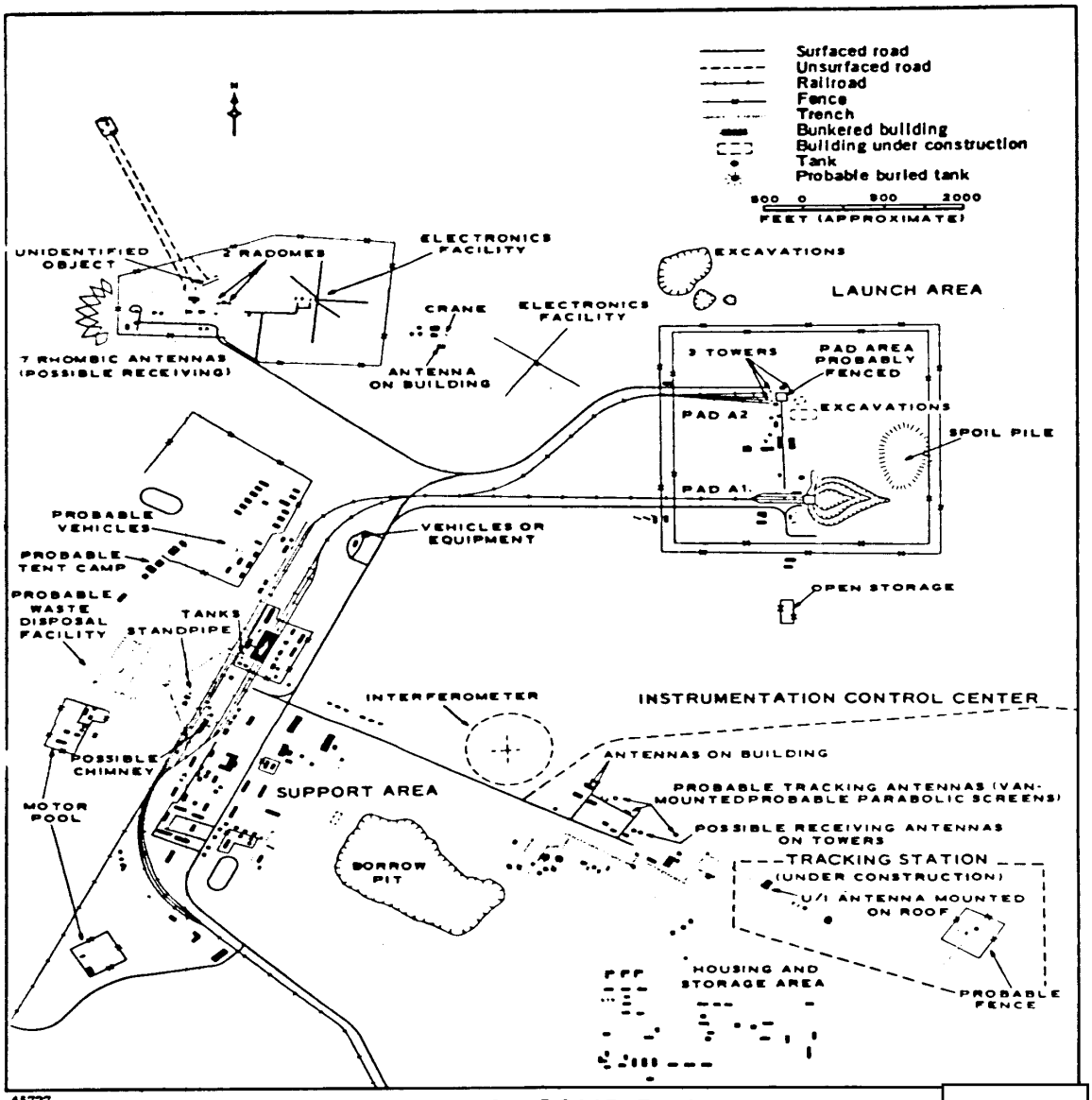

Figure 13. COMPLEX A

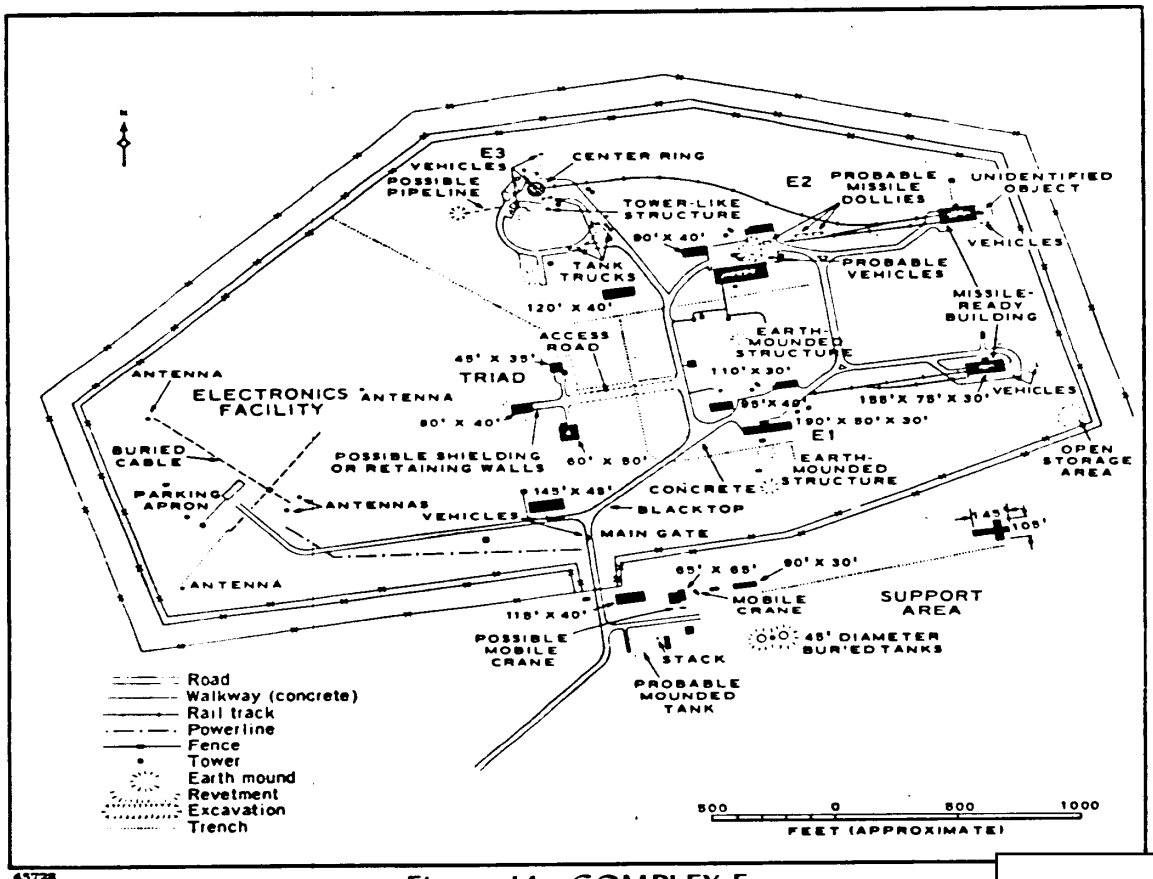

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Figure 14. COMPLEX E

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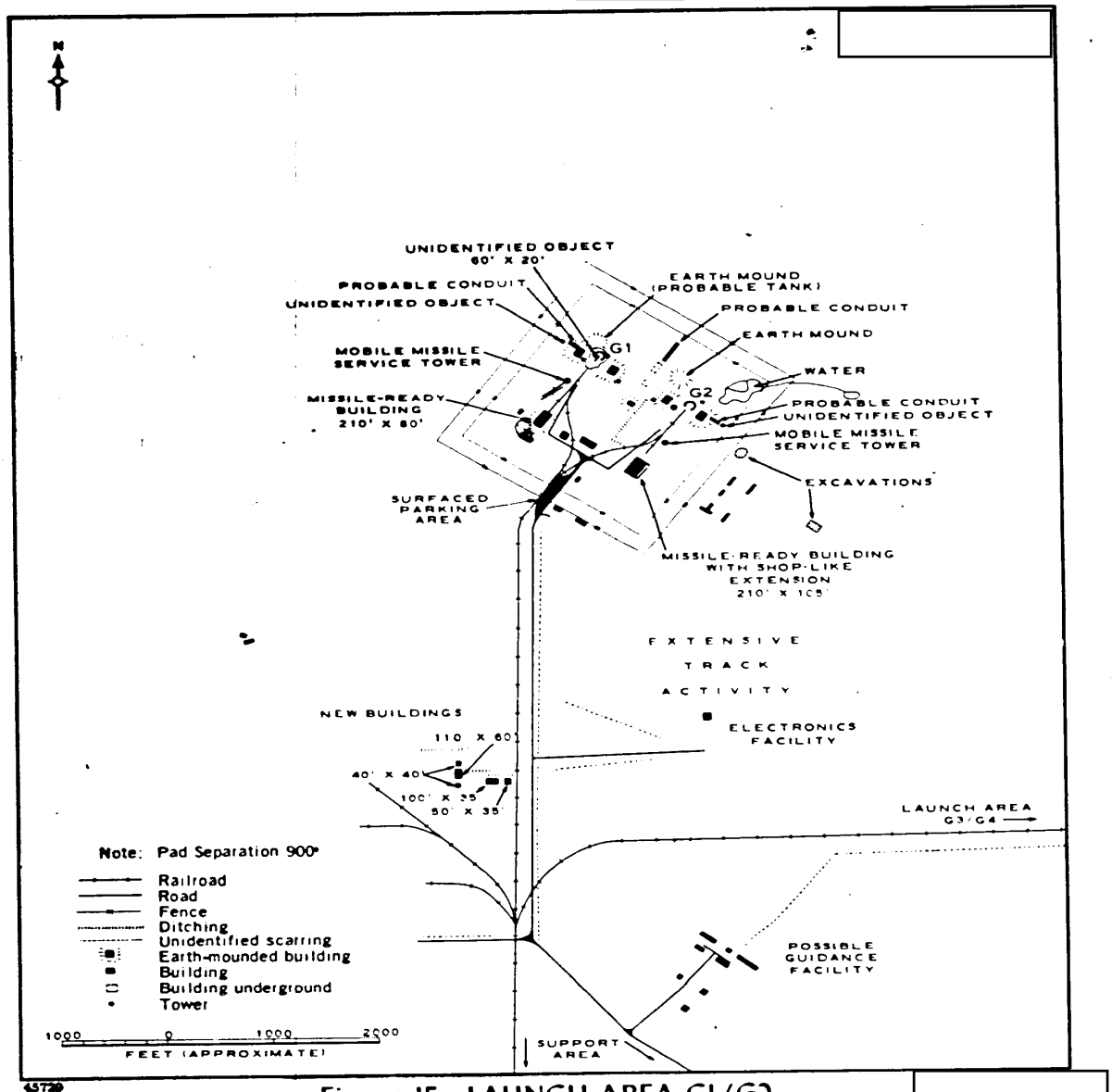

Figure 15. LAUNCH AREA G1/G2

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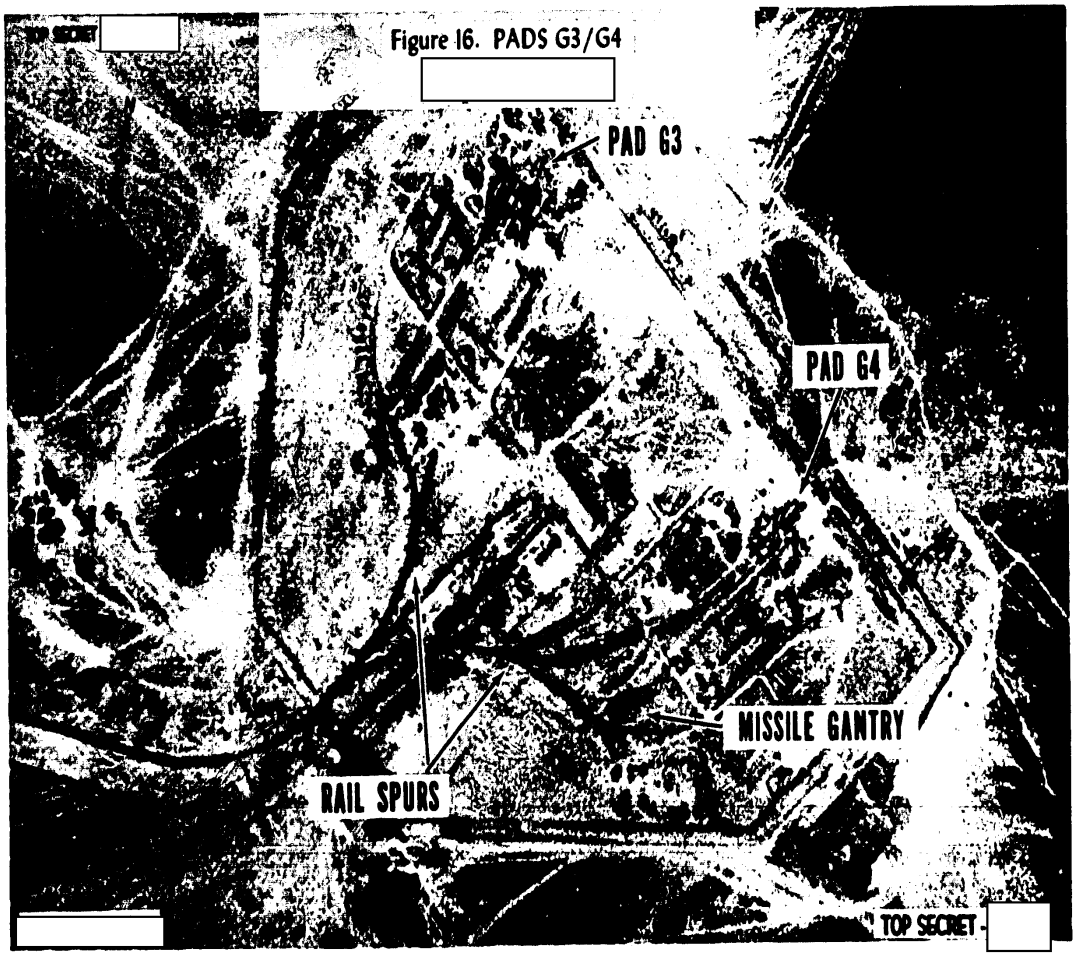

Figure 16. PADS G3/G4

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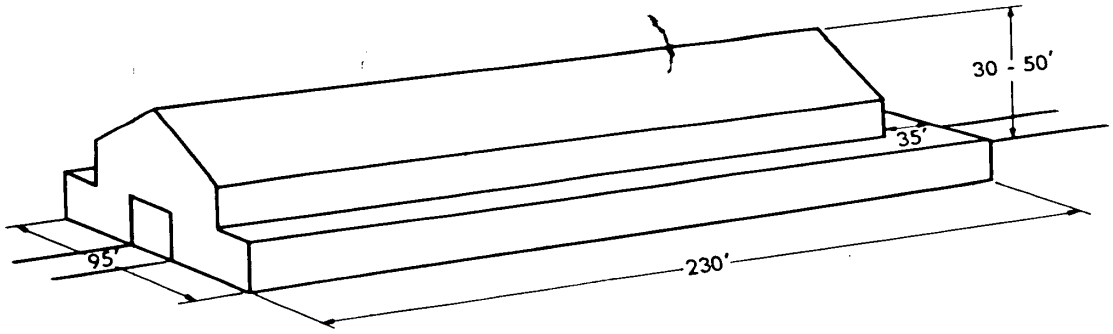

PROBABLE UPPER STAGE ASSEMBLY BUILDING WEST OF COMPLEX G

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Figure 17. SPACECRAFT ASSEMBLY BUILDINGS AT COMPLEX A AND COMPLEX G

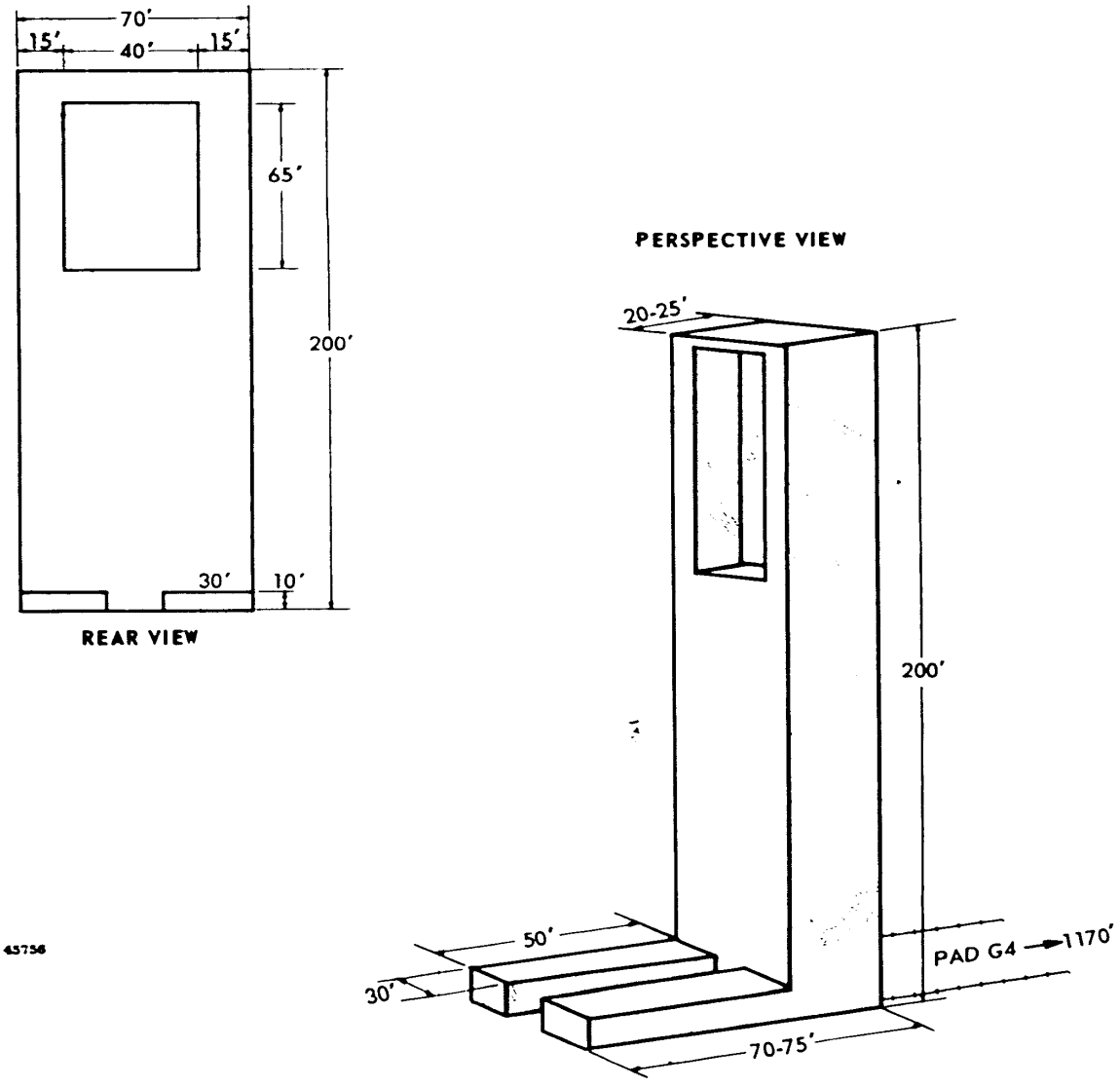

Figure 18. THE GANTRY AT PAD G4

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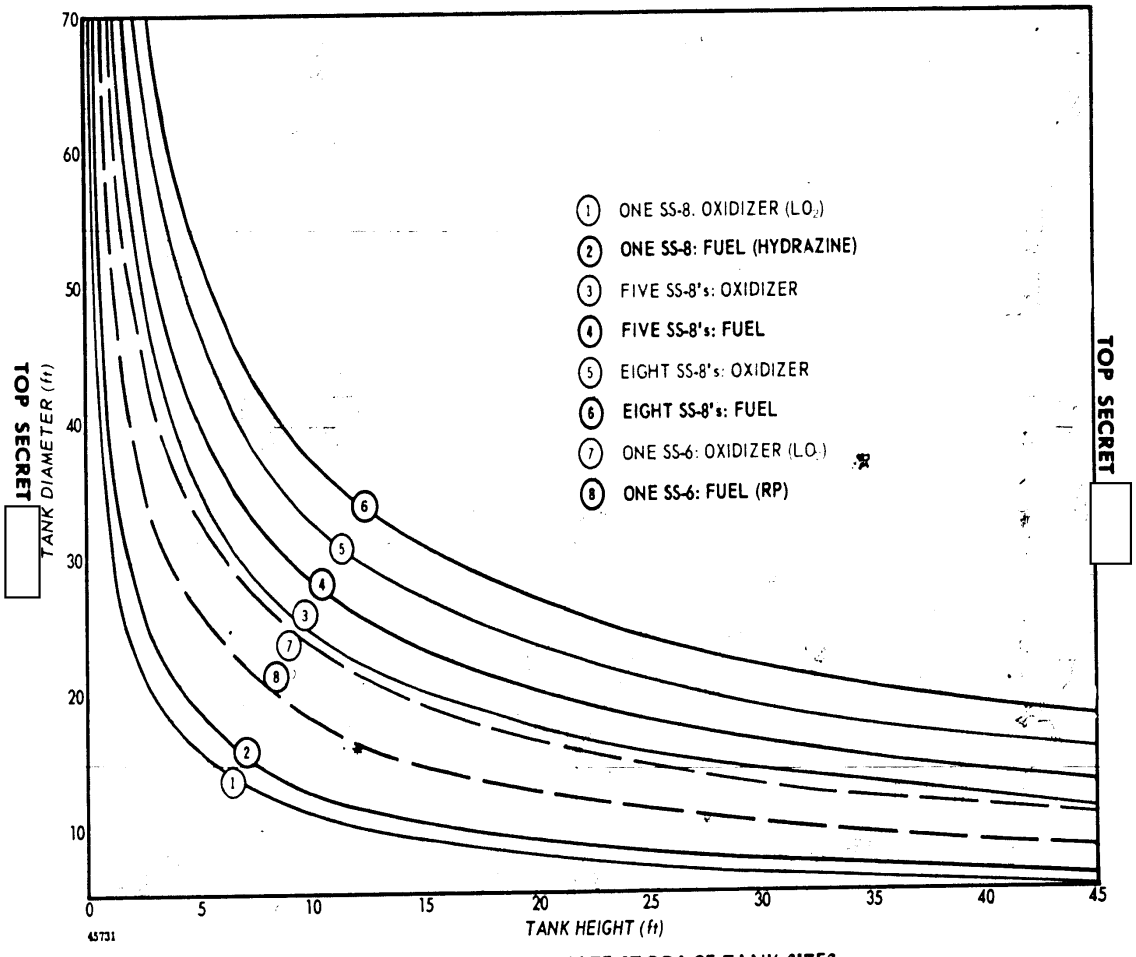

Figure 19. APPROXIMATE STORAGE TANK SIZES

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LOCATION	POSSIBLE TANK DIAMETERS	POSSIBLE TANK CAPACITY	APPROXIMATE TANK HEIGHT REQUIRED (ft)
PADS G1/G2	One 65–foot effective diameter tank, considered to be for fuel, located forward of each pad	2 fillings of a 5–clustered SS-8 2 fillings of an 8–clustered SS-8	
	One 70–foot–square building on each side of pad, each considered to contain one 40–foot effective diameter oxidizer tank	2 fillings of a 5–clustered SS-8 2 fillings of an 8–clustered SS-8	
PAD A2	Each of two buildings considered to contain one 20–foot effective diameter tank	2 fillings of fuel for one SS-8 2 fillings of oxidizer for one SS-8	
PADS E1/E2	Three buildings, considered to be one fuel / two oxidizer, all with 25–foot effective diameter tanks	2 fillings for two SS-8's (double tracks)	
COMPLEX E, KAPUSTIN YAR	Two 40–foot effective diameter tanks considered to be for the SS-5, using a RFNA UDHM mix	2 fillings for two SS-5's (two pads)	

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Figure 20. APPROXIMATE TANK HEIGHTS AT VARIOUS LOCATIONS

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Approved For Release 2003/09/02 : CIA-RDP78T05439A000400060010-4

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Scientific Intelligence Report

NEW SPACE FACILITIES AT THE TYURATAM MISSILE TEST CENTER

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[ ]

14 October 1964

CENTRAL INTELLIGENCE AGENCY

OFFICE OF SCIENTIFIC INTELLIGENCE

TOP SECRET [ ]

Project Officer

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Scientific Intelligence Report

New Soviet Solar Research Center and Its Relationship to the Manned Space Program

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10 November 1964

Office of Scientific Intelligence

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Scientific Intelligence Report

NEW SOVIET SOLAR RESEARCH CENTER AND ITS RELATIONSHIP TO THE MANNED SPACE PROGRAM

5X1 [redacted]

10 November 1964

CENTRAL INTELLIGENCE AGENCY
Office of Scientific Intelligence

TOP SECRET [redacted]

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Project Officer

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Brief

PREFACE

Large solar observatories have potential value to manned space flight because of their use in predicting solar flare activity. Cosmic rays generated in solar flares are currently the greatest natural hazard to manned space flight.

For several years the Soviet press has been describing a new solar observatory under construction somewhere in the Sayan mountains southwest of Irkutsk.

Overhead photography provides the opportunity to locate and follow the development of the observatory's physical plant and thus to establish its size and its rate of expansion. This may indicate the purpose for which the observatory was established.

This study was based on all available information including [redacted] photography, contact reports, and Soviet press releases.

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[redacted]

NEW SOVIET SOLAR RESEARCH CENTER AND ITS RELATIONSHIP TO THE MANNED SPACE PROGRAM

SUMMARY AND CONCLUSIONS

A new solar observatory installation occupies two sites on either side of the road from Irkutsk to Turta, Mongolia, very close to the Mongolian border. This location is unusually cloud free which was probably an important factor in selecting the site as a solar observatory (center for flare prediction research).

The primary purpose of the new observatory is solar activity research and flare prediction, probably in support of the Soviet manned space program. This conclusion is based on the involvement of the observatory's director, V. Ye. Stepanov, in the early phases of solar flare prediction research and the great speed with which the observatory has been built after trial predictions of solar flares had been successfully completed.

The observatory is to receive a two meter solar telescope which should be a high quality instrument. With such an instrument, it will be one of the best equipped centers for solar research in the world. Stepanov is believed to be competent to exploit the capabilities of the telescope.

DISCUSSION

Construction of Solar Patrol Station

A TASS release in 1960 mentioned that a station for studying the sun and cosmic rays was being set up on a summit of the Sayan range in Siberia at an altitude of 2,000 meters (6,560 feet) In September 1961, another report announced the establishment of the first high altitude station of the sun service subordinate to the mountain solar expedition of the Siberian Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation (SibIZMIR). It added that the atmosphere is transparent and rarified at the site and the sun is covered by clouds only seventeen days per year on the average. In August 1962 a TASS release stated that a Siberian research station for the solar corona was under construction in the mountains southwest of Irkutsk.

Overhead photography of [redacted] 25X1D showed a group of buildings on a hill north of the road from the town of Mondy to the Mongolian border that was not there in [redacted] 25X1D (See Map and Figure 1.) The installation was probably planned in [redacted]

LOCATION OF SOLAR PATROL STATION AND SOLAR OBSERVATORY NEAR MONDY

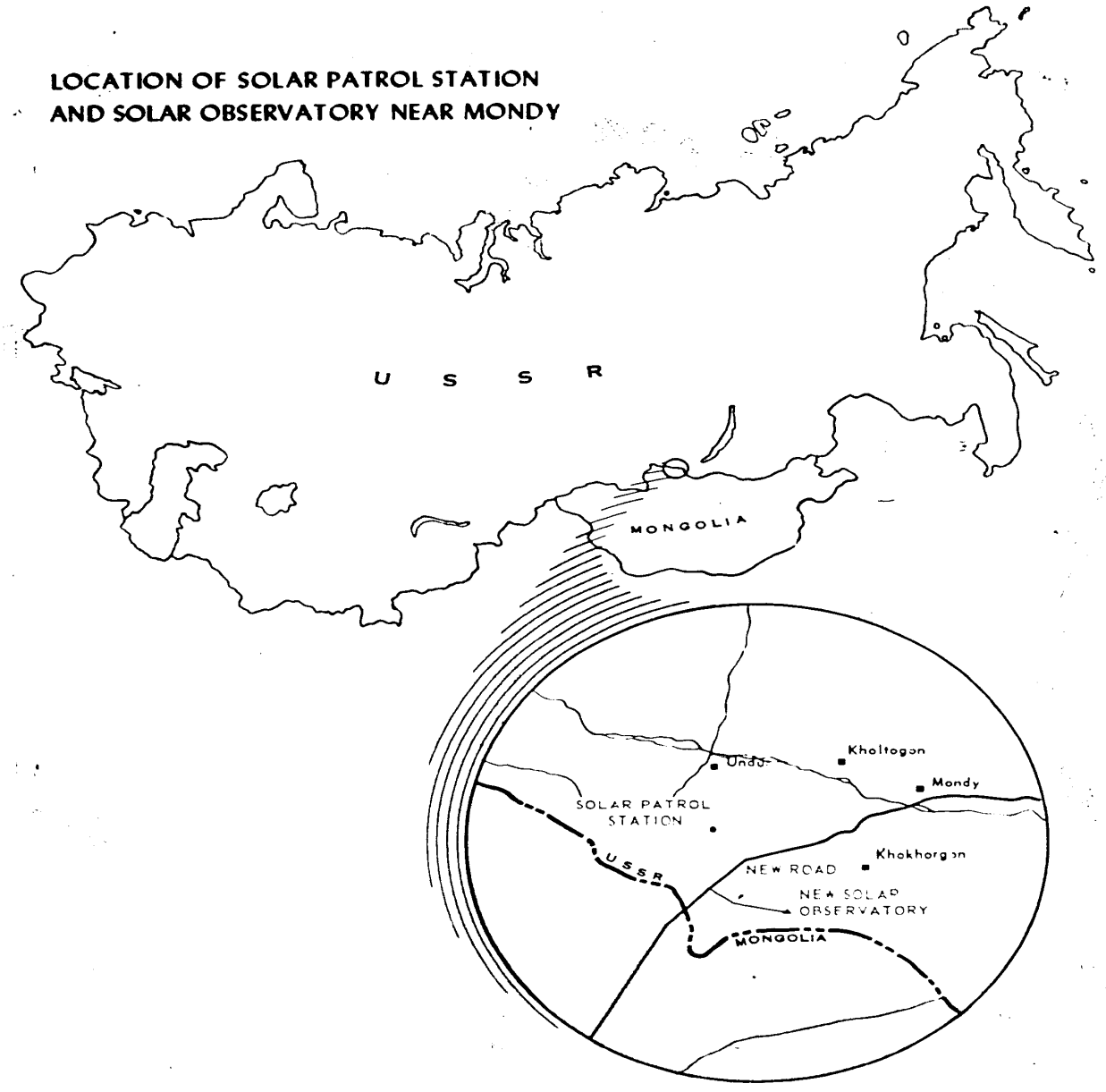

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Figure 1: SOLAR PATROL STATION NEAR MONDY

as a solar patrol station* and, if the 1961 press statement was accurate, it was built in 1961. In 1962 it still had the status of a solar patrol station although apparently the Siberian Institute of Terrestrial Magnetism planned to add a coronograph to the routine solar patrol instruments at the station.

Need for Solar Activity Research Center

From 1957 to 1961, V. Ye. Stepanov and other scientific workers at the Crimean Astrophysical Observatory were studying magnetic fields and other properties of solar active regions. They observed that certain magnetic field configurations tended to precede large solar flares. With the beginning of the Soviet manned space program in 1961, solar flares became a matter of concern to space program planners because of the cosmic ray radiation hazard accompanying them. It was probably in response to this concern that the Crimean Astrophysical Observatory made trial predictions of solar flares based on magnetic field observations from 1961 to 1962. They reported considerable success in predicting a great majority of the large flares. (See OSI-SB/64-7, 14 May 1964, SECRET.)

The main difficulty with this method of flare prediction is that it depends on frequent observations of the sun with sophisticated equipment. The magnetic field data published by the Crimean Observatory clearly show the effect of seasonal variations in cloudiness and hence in the capability of the observatory to make flare predictions. The Soviets made more magnetic field observations for flares during the months of July, August and September than all other months combined. No observations were available for flares occurring in January and February.

In 1962 the decision probably was made to step up solar activity research and to make flare predictions on a more regular basis. An observing site with a minimum of cloudiness clearly was needed. A U.S. visitor to the Soviet Union in the fall of 1962 learned that Stepanov had gone to Siberia to set up his own observatory. He probably was examining the patrol station site, since the final decision to proceed with construction undoubtedly was based on his approval.

Construction of the Solar Observatory

By [redacted] construction of the observatory was well under way. A trail has been put through to a second site south of the road (see map) and a few buildings had been put up. Construction continued all winter and by [redacted] was essentially completed with most or all of the observing equipment installed.

The completed observatory was described by a March 1964 TASS news release which said that a few months earlier workers of the Siberian Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation had built laboratories and houses and had installed equipment. Scientists already were studying solar physics, cosmic rays, and earth currents. Dr Vladimir Stepanov was identi-

* A solar patrol station is equipped with relatively small optical and radio telescopes for making frequent routine observations of the sun. It is manned by a small number of astronomer-technicians. An observatory would have a number of larger observing instruments and would be manned by astronomers and astrophysicists in addition to technicians.

X1

fied as scientific leader of the expedition. Photographs accompanying the release pictured an antenna for monitoring solar radio emission, a chromosphere-photosphere patrol telescope, a coelostat for a horizontal solar telescope and a solar spectrograph or magnetograph.

25X1D Overhead photography of shows the observatory much as it was
25X1D described in (See Figure 2.) At that time, the southern site was fenced in and contained seven or eight buildings. The largest of them, about 80 feet by 20 feet, and oriented with its long axis in the north-south direction, probably houses the horizontal solar telescope.

Planned Two-Meter Solar Telescope

25X1C A recently learned from a Soviet observatory director that Stepanov is getting a two meter solar telescope for his observatory. This possibility is supported by the most striking feature of the
X125X1D photograph, a road being constructed to the southern site. (See Figure 3.) A two meter solar telescope is a very large instrument and would be difficult to build at a site served only by a trail.

With a two meter solar telescope, the observatory should be a leader among centers for solar research. The planned instrument is probably comparable to the solar telescope at Kitt Peak, Arizona, which is presently the largest and most powerful of its type in the world. Stepanov is believed to be capable of making good use of such a telescope.

The quality of the solar telescope can be expected to be from good to excellent depending on where it is constructed. The Soviet designed and built solar tower telescope at the Crimean Astrophysical Observatory is a first rate instrument copied from a successful U.S. design. Consequently, the Soviets probably could copy the Kitt Peak telescope and produce an installation of comparable quality. The Zeiss Optical Works in East Germany has built telescopes of outstanding quality and original design, and if the Soviets ordered a two meter solar telescope from East Germany, they probably would receive a very high quality instrument.

If the Soviet method of making flare predictions is valid, the new telescope is likely to improve the quality of the predictions. It should allow solar magnetic field observations to be made more rapidly and with improved resolution. The improved data may give Soviet investigators new insights into solar flare processes which in turn would allow them to improve the accuracy of their predictions. With this facility, the Soviets probably will be able to improve upon the quality of their short-term (2-3 day) predictions. On the other hand, if the connection between solar magnetic fields and solar flares is already oversimplified, improved data will be more confusing than it is enlightening. Even if it does not improve flare predictions, a two meter solar telescope will be a useful tool for basic solar research.

Probable Connection with the Manned Space Program

The speed with which the new observatory is being built suggests that it is a priority project. Stepanov left for Siberia to examine the proposed site almost immediately after completing the trial flare predictions in 1962. The plans for the observatory must have been completed in about nine months and executed in another

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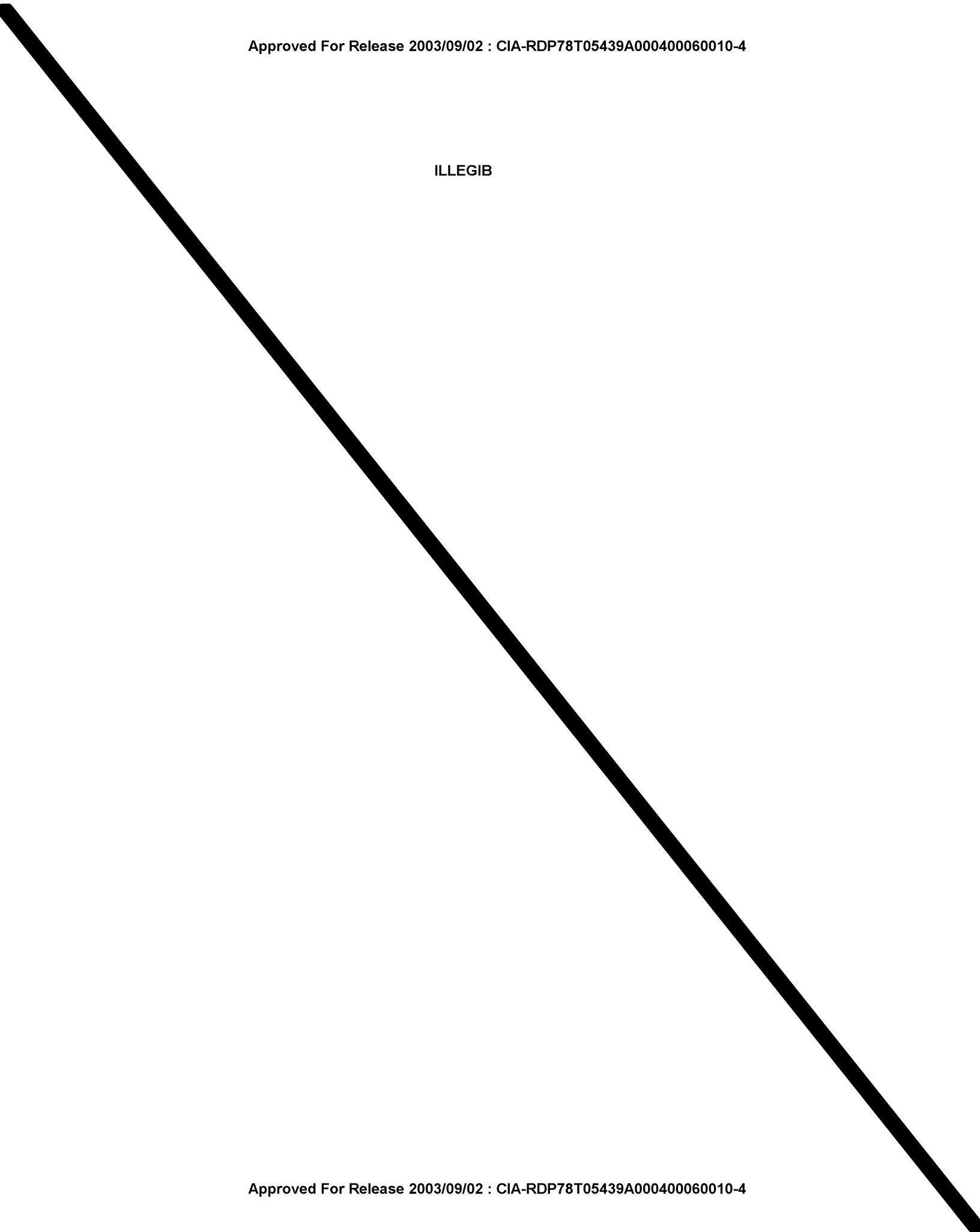

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Figure 3: NEW ROAD TO SOLAR OBSERVATORY NEAR MONDY

seven months, with most of the construction being done during the winter of 1963-64.

The timing of the project also suggests a connection with the space program. It was started soon after Stepanov and others demonstrated that a sophisticated study of solar activity could lead to the discovery of a method of predicting solar flares on a short term basis. The 1964 Soviet national report to COSPAR mentioned that short term solar flare predictions were made just prior to the Vostok 5 - Vostok 6 mission in 1963. Soviet bioastronautics authorities continue to express concern over the radiation problem during manned space flights. Thus it seems likely that the Soviet manned space program in some way initiated or stimulated the project and intends to benefit from research performed at the observatory. To date the observatory has not been included in the list of observatories supporting the Soviet IQSY Program. All other known Soviet observatories' solar research programs are on the list. This tends to confirm the special nature of the new observatory.

The fact that the new solar observatory has been rushed to completion at a time when expenditures on astronomical facilities are being criticized lends support to the view that this observatory represents a high-priority project, possibly related to the Soviet manned space program. It is conceivable that the costs may have been borne by the space program, although we have no evidence of this beyond the space program interest in flare predictions. The cost to the space program probably would not be large, comparatively speaking. For example, several U.S. astronomers have pointed out that an astronomical facility as large as the 200-inch Mt. Palomar telescope could be built and staffed for the cost of a single Ranger probe launching.